The effect of riverine particulate material on the growth rate of freshwater cyanobacteria *Synechococcus sp*.

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The supply of particulate material to natural waters plays a vital role on the global cycles of the elements. Notably, the mass of most elements brought by rivers to the ocean as particulate material far exceeds the corresponding dissolved flux [1] [2]. For example, the global flux of the limiting nutrients Si, P, and Fe transported to the oceans within particles exceeds the corresponding dissolved flux by factors of 50, 100, and 350, respectively [1]. As such it seems reasonable to expect a close link between the particulate material supply and primary productivity in natural waters.

To explore this link, a series of batch system growth experiments were performed with a typical freshwater cyanobacteria *Synechococcus sp*. grown in dilute BG11 media in the absence and presence of basaltic (Iceland) and continental (Mississippi) riverine particulate material. Results demonstrate that these riverine particulates significantly increase cyanobacterial biomass production. This increase likely reflects the dissolution of the particulates liberating nutrients to the fluid phase, as confirmed by ICP-MS analyses. Particulate dissolution is enhanced by increasing pH due to metabolic activity. The link between microbial growth rate and the particulates was also confirmed through the direct attachment of microbes to particulate surfaces likely through an increase in production of exopolymeric substances (EPS), which potentially may facilitate also a higher burial efficiency of organic carbon.

[1] Jeandel & Oelkers (2015) *Chem. Geol.* **395**, 50-66 [2] Oelkers et al. (2011) *Appl. Geochem.* **26**, S365-S369